

# WISCONSIN TRAFFIC SAFETY REPORTER

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2002

## FOCUS ON

### GIS

GEOGRAPHIC INFORMATION SYSTEMS

*A powerful new  
public safety tool*

by Martha Florey, Assistant Director  
WisDOT Bureau of Transportation Safety

Location, location, location. Like in real estate sales, location is of primary importance for public safety analysis and response. Public safety analysts describe crimes, fires, traffic crashes and other events by combining location with other characteristics of the scene, people and event.

Geographic Information System technology uses location as a common factor to draw information from databases to illustrate crash causes and outcomes. Crash location includes roadway, roadside, environmental and demographic features that describe crash causes; the location of police, fire and health care facilities describes emergency response and helps explain crash outcomes.

In this issue we introduce GIS and report on several GIS-related projects around the state. In Brown and Marathon Counties (see map) new technology identifies crash locations quickly, easily and accurately, and in Madison, traffic engineers discard paper maps in favor of GIS crash analysis. A US Department of Justice-funded project in Milwaukee creates Internet maps that are accessible to the community at large. Related projects underway at WisDOT include automation and streamlining of crash reporting and creation of a Web-based data management application for Wisconsin's local roads.

But GIS isn't just technology; it's a system that changes the way public safety organizations interact. Government agencies and other organizations must collaborate to make their data useful to others. Each of the projects covered here reports

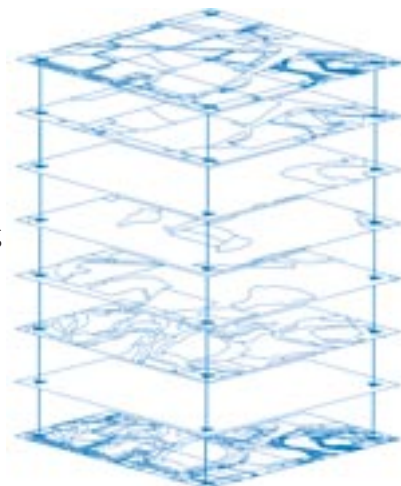
*continued on page 5*

## The gist of GIS

A Geographic Information System (GIS) isn't one thing but rather a collection of computer hardware, software, data, organizations and professionals that together helps people represent and analyze all kinds of information about a place.

Unlike a paper map, where 'what you see is what you get', a GIS map can combine layers of information according to the user's needs. For example, a city planner concerned about flooding might create a GIS map showing water features, flood risk zones, digital ortho-photos, zoning designations—even the locations of community disaster volunteers. GIS is a powerful tool in many areas, including traffic safety.

*continued on page 7*



## Wisconsin Public Safety GIS Users Group

*GIS can be a powerful tool in analyzing complex public safety issues.*

*GIS technology is evolving rapidly.*

*Collaboration is essential and challenging.*

Three good reasons for the creation of this new users group. Founded in March 2002, the group came into being when Milwaukee Police Department crime analysts asked their software vendor if he knew any public safety GIS users with whom they could discuss ideas and problems. He suggested they organize a users group.

The first meeting had a mix of people from police departments, land information offices, municipal planning departments, emergency management offices, transportation and corrections agencies.

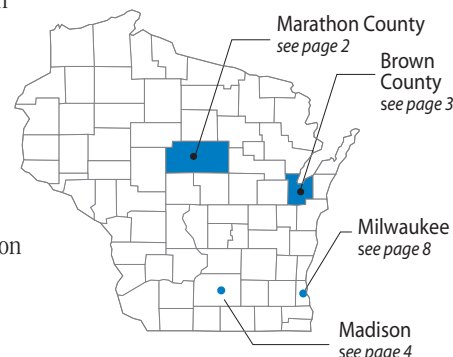
Each meeting of this informal group will be hosted by an agency which may provide a demonstration or discussion of local GIS initiatives. Discussion topics have included: what does and doesn't work, sources and quality of data, 3-D modeling, and disaster management. The agenda for the September 18 meeting in Madison includes a presentation on traffic incident mapping and database recording, and an ArcView tutorial on spatial analysis.

The group will:

- make policy and procedure recommendations to users and state organizations
- share information on training and funding
- identify issues not only at the individual agency level but also institutional relationships that support the coordination of data at the municipal and county levels.

Contact Michelle Arneson, Green Bay Police Department  
at (920) 448-3249 or michellea@ci.green-bay.wi.us.

Source: UW Land Information &  
Computer Graphics Facility





Holly Urbain, WisDOT, showing Marathon County Sheriff Randy Hoenisch how to use a hand-held GPS receiver during a training session.

### Crash Location

	Current WisDOT process	Using GPS
<b>Accuracy</b>	150 feet to over one mile	±3-15 feet
<b>Timeliness</b>	6-18 months	3-9 months
<b>Completeness</b> (see Map 1)	19%	97%



The **Wisconsin Traffic Safety Reporter** is published by the Bureau of Transportation Safety, Wisconsin Department of Transportation. Its purpose is to promote transportation safety, to recognize worthwhile programs, to educate and to share ideas with safety professionals.

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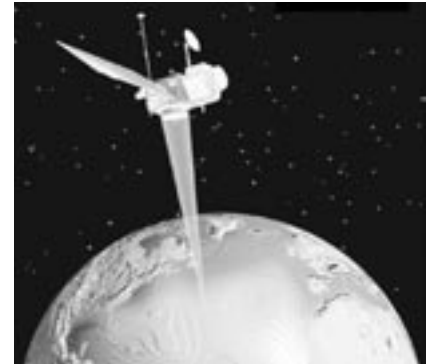
**Bureau of Transportation Safety**  
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Highway Traffic Safety Administration.

# Where—exactly—was the crash?

## A tale of two counties...

Ideally, whenever a crash occurs, all the pertinent information about location, road conditions, etc, would be quickly, easily and accurately recorded, so that it could then be used to learn about crash causes and to make safety improvements.

But the current WisDOT process for recording crash information is laborious and time-consuming. Law enforcement officers fill out Form MV4000 with a wide variety of crash information. Crash location is specified by the “at/on” method, for example, “at James St. on Highway 151.” The form is then sent to the WisDOT Traffic Crash Section, and from there the process includes inmates in the state’s prisons using the officer’s “at/on” information to look up a crash site reference point (RP) in the Wisconsin State Trunk Highway Log. This RP is then entered into a mainframe data set.



## Law enforcement officers in Marathon County

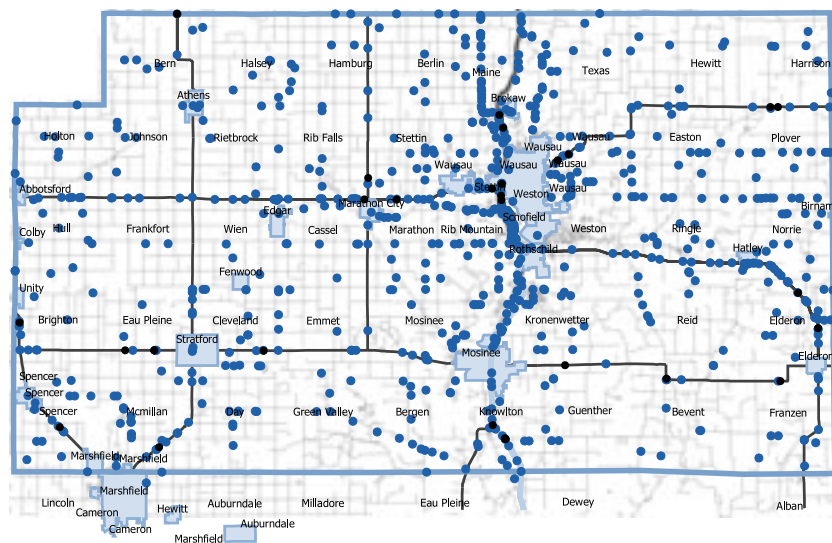
### Trying out hand-held GPS (Global Positioning System) receivers

Now WisDOT-Division of Transportation Districts have teamed up with the Marathon County Sheriff’s and Planning Departments and the Wisconsin Division of State Patrol to see if using space age GPS technology can improve this process, and they found that it can—dramatically (see table at left).



Deputies get acquainted with using GPS receivers to find out exactly where in the world they are.

continued next page ►



### Map 1 GPS vs RP

Results of two different methods of locating crash sites in Marathon County; the traditional RP (Reference Point) method, and using GPS data, which is much more accurate and complete.

Collected 9/01

**Crash Location**  
● Reference point  
● GPS

## Marathon County

from page 2

Marathon County sheriff's deputies and state troopers were trained by WisDOT staff on how to use hand-held GPS units. A GPS device receives signals from several satellites and then uses triangulation to calculate the user's exact coordinates on earth ( $\pm 3-15$  feet).

Deputies and troopers collected GPS coordinates for two kinds of calls: crashes and alcohol-related incidents (OWI and underage drinking in a vehicle). Some vehicle/deer crashes involved only property damage and were reported later by the driver, so it was difficult to pinpoint crash sites, and it was decided not to collect this information. For alcohol-related events, they started out recording the point of first observation, but later changed to the point of the traffic stop.

During the study, officers entered crash locations on the MV4000 form using both GPS coordinates and the old "at/on" information. Accuracy with the old process was sometimes way off. For example, one deputy was confused about which road he was on.

Using GPS crash location data cut WisDOT's overall crash information collection time in half; the GPS data is available almost immediately, but all the other crash information had to be gathered the old-fashioned way.

GPS data has many potential uses. For example, locations of under-age drinking citations (see Map 2) might suggest important patterns. The Marathon County sheriff has already been able to radio GPS crash site coordinates directly to the pilot of the Marshfield Air Spirit EMS helicopter.

### Lessons learned

- GPS is a viable technology for locating crash sites.
- Teamwork is crucial, and, from the beginning of a project, be sure all appropriate players get involved.
- Provide in-depth training for data collectors.
- Most importantly, to do their jobs effectively, officers need to see how the data can be used.

## Brown County

### AVL (Automatic Vehicle Location) pins down crash/incident locations

Brown County is the first in Wisconsin to use AVL to easily and accurately record the locations of crashes and other incidents. A GPS (global positioning system) receiver in the police vehicle continually calculates the vehicle's exact location, and, when on site, the officer simply pushes a button on the vehicle's laptop computer and the radio transmits the coordinates to the Brown County Communications Center (BCCC).



Green Bay Police Dept. squad car with GPS antenna on the roof.

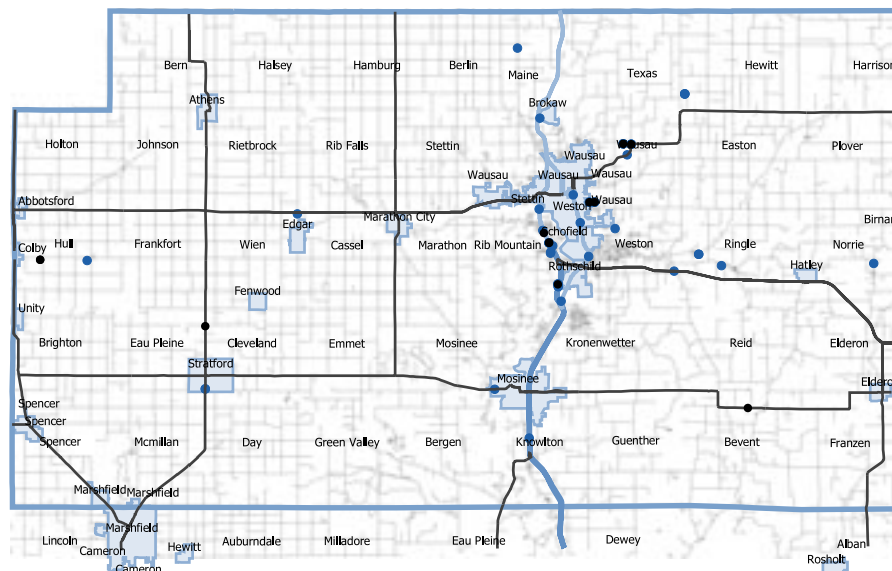
In 2000, Brown County established the BCCC, a central emergency service and dispatch center. As the center was being established, the Brown County Planning Commission/Green Bay MPO (Metropolitan Planning Organization) created the AVL pilot project and developed a countywide GIS address database that allows the BCCC to quickly identify the location of 911 callers. With funding support from WisDOT

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## GIS technology and collaboration

The power of GIS comes from bringing together all the relevant geographic data layers, and this requires strong inter-agency collaboration.

- Agencies involved in a common project should develop a comprehensive project agreement upfront. Agencies whose data can be used by others should reach out to them, whether or not they're currently working on a common project.
- To avoid duplicating efforts and developing incompatible approaches, standards and definitions, agencies need to compare notes about their GIS-related plans and current data sources, and they need to set up ways to share data.
- Agencies can't always agree on common data standards because they often have sizeable investments and much "legacy data" in different standards, but they can work together to find a neutral integration standard which serves as an inter-standard "hub" or "crosswalk."
- Often considerable work is required to bring different agencies' data sets up to the same level of development.



Map 2

Citations for under-age drinking in a vehicle, located in Marathon County using GPS data.

Collected  
7/4/01–12/3/01

Under Age  
● Female  
● Male

Contact Diane Sommerfeld,  
WisDOT District 1, at  
(608) 246-5408 or  
diane.sommerfeld  
@dot.state.wi.us,  
or Harlan Reinders,  
Marathon County  
Sheriff's Department, at  
(715) 261-1204 or  
hgreinders  
@mail.co.marathon.wi.us



## Hot Topics?

### Let us know.

If you know a topic that would make a good article for the *Wisconsin Traffic Safety Reporter*, please contact the editor, John Jordan, at (608) 274-3107 or [jordan@danenet.org](mailto:jordan@danenet.org).

Your input can help people all around Wisconsin learn about what's up in traffic safety.

### Your mailing address

### Thanks ... and a reminder

We here at WisDOT Bureau of Transportation Safety want to thank those of you who have sent us address updates. If you haven't yet, please send address information to Judy Gelhaus at (608) 267-2470 or [judith.gelhaus@dot.state.wi.us](mailto:judith.gelhaus@dot.state.wi.us).

Also, let us know if you know other people who might enjoy getting this newsletter.

Contact Bill Putnam,  
City of Madison Traffic  
Engineering Division,  
at (608) 266-5987 or  
[bputnam@ci.madison.wi.us](mailto:bputnam@ci.madison.wi.us).

## Madison

# Crash location; from paper maps to GIS

With funding support from WisDOT-BOTS, the City of Madison Traffic Engineering Division is developing a crash location GIS.

Project goals include:

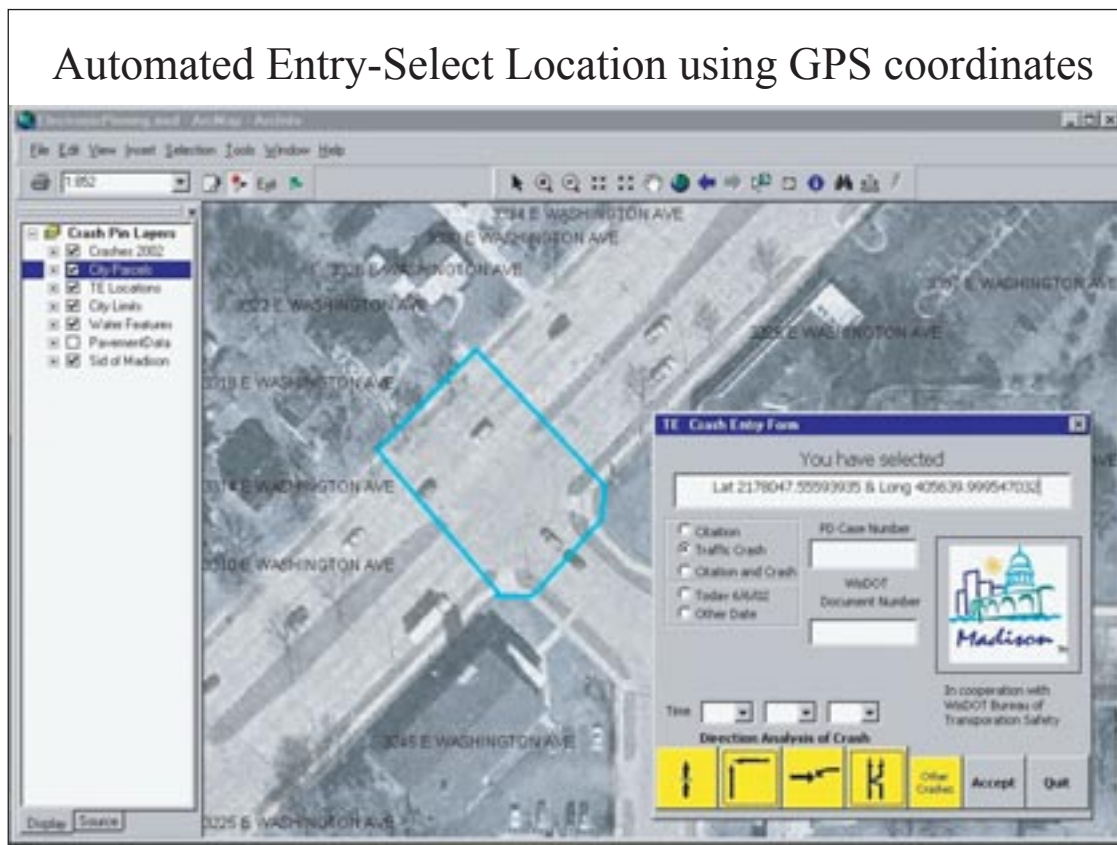
- Automate crash location mapping and intersection crash diagramming.
- Speed the transfer of crash data to users, and enhance data query capabilities.
- Work more directly with other agencies.

Migrating to GIS has required quite a lot of programming work to anticipate users' needs. Unexpected problems have emerged. For example, distinguishing intersection from non-intersection crashes is important, but initially, in migrating from the old text database, the GIS software lumped them together.

Soon their GIS will be available via their intranet which will improve sharing, e.g., with the city's planning department. A long-term goal is to make Web-based data queries possible. Other goals include automating crash data reporting by police officers (using aerial photos or GPS), and tying in with Badger TraCS (see page 5), the electronic crash data reporting and management system which WisDOT is implementing.

In order to enhance collaboration, project members have started to meet with representatives of other agencies (e.g., Madison Police Department, Dane County Sheriff's Department and Dane County Land Information Office). Another important forum is the Wisconsin Public Safety GIS Users Group (see page 1).

see map below and on next page ►



City of Madison's new GIS-based system for entering and retrieving crash information by intersection name. Users can select data layers from the left menu, and the customized box on the right enables users to analyze different classes of crashes. In the 'You have selected' box, instead of GPS coordinates, street names can be entered.

## Badger TraCS

# WisDOT's new Traffic and Criminal Software



The WisDOT Traffic Accident Section's TraCS project to automate crash reporting is well underway, and if all goes as planned, crash reporting software will be available to all Wisconsin law enforcement agencies by the end of 2003. TraCS software is non-proprietary and free of charge.

Traffic and Criminal Software (TraCS) was developed by the state of Iowa in partnership with the Federal Highway Administration as part of a national model for the development of automated reporting systems. The national model TraCS software includes an integrated set of electronic forms for crash, citation, OWI, and crime/incident reporting and for commercial motor vehicle inspections.

To date, 15 states have signed licensing agreements to develop their own TraCS forms. Each participating state must agree to share all its improvements with other participating states and to have a single point of contact for all its TraCS activities. In Wisconsin, that point of contact is the Traffic Accident Section. Projects for developing other TraCS modules in Wisconsin may be implemented separately, but must be coordinated through the Traffic Accident Section. Increasingly, government agencies are finding they can improve performance by working together rather than duplicating efforts and developing incompatible solutions.

Automated reporting will improve the accuracy, timeliness and ease with which crash data is collected and made available for analysis. TraCS software can incorporate other data-gathering technologies such as digital cameras, wireless communication, global positioning system (GPS) locators, and bar-code readers.

In Iowa, the Center for Transportation Research and Education (CTRE)'s GIS-based "smart map" incident location tool interfaces with the TraCS electronic crash reporting software to find and map crash sites. For its crash mapping, Wisconsin is also pilot-testing other location data collection technologies, including GPS (see article about Marathon County on page 1) and Automatic Vehicle Location (see Brown County, page 3).

The current Wisconsin crash reporting system requires laborious, time-consuming paperwork, with law enforcement officers filling out an accident report form (MV4000) and mailing it in to WisDOT for processing.

In Wisconsin, TraCS is being implemented for crash reporting in phases and in a unique way which demonstrates the application's flexibility. TraCS was originally developed for field and agency data collection only, not as an internal data entry system. Wisconsin is the first state to use TraCS as a replacement for its current data entry system and as the means to automate crash data collection for law enforcement agencies statewide. An internal data entry system (ie, within the Traffic Accident Section) for the driver accident report form (MV4002) has been developed, and work is now underway to automate MV4000 data entry both internally and for law enforcement.

Visit [www.dot.state.wi.us/natmodel](http://www.dot.state.wi.us/natmodel) (e.g., a demo CD is coming soon) or contact Patricia McCallum, Chief, WisDOT Traffic Accident Section, at (608) 266-1077 or [traffic-accidents.dmv@dot.state.wi.us](mailto:traffic-accidents.dmv@dot.state.wi.us).

## FOCUS ON GIS

*continued from page 1*

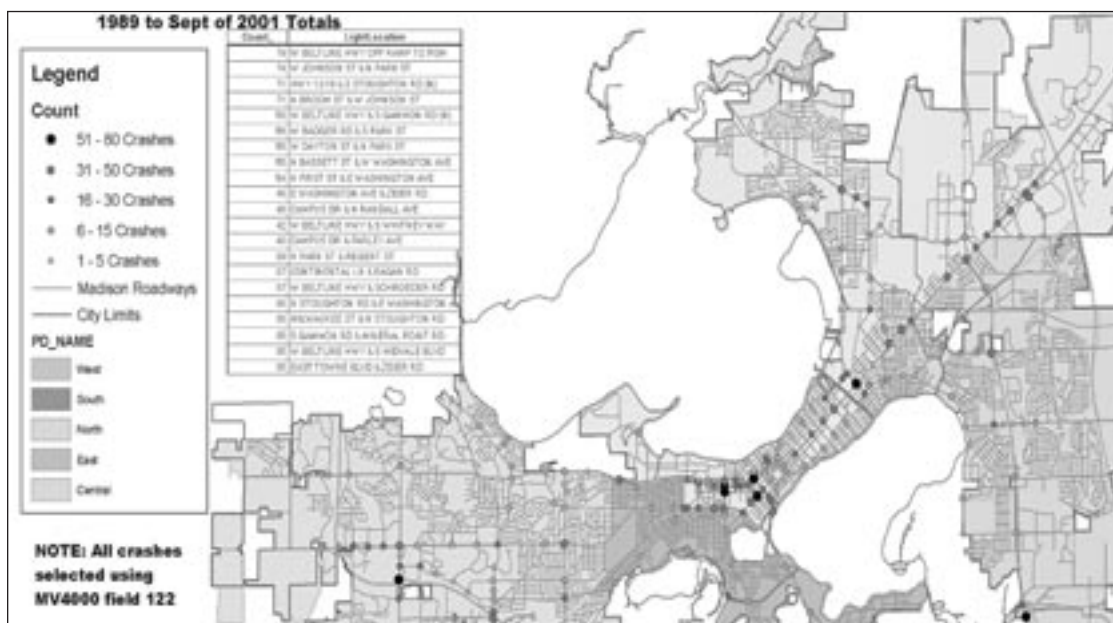
that developing a culture of cooperation was a central challenge. Recently the Wisconsin Public Safety GIS Users Group (see page 1) has sprung up to foster this very discussion and collaboration across disciplines and across agencies.

We hope this issue gives you ideas about using these information age tools now at our fingertips. Better reporting and analysis of traffic crashes can lead to safer roads in Wisconsin.

Contact Martha Florey at (608) 266-3557 or [martha.florey@dot.state.wi.us](mailto:martha.florey@dot.state.wi.us)

## Crash location; from paper maps to GIS

*continued from page 4*



*Red light  
running  
crashes*

Locations of red-light-running crashes in Madison ranked by frequency (see upper left legend) for the last 13 years.

Contact Joe Nestler, PE  
WisDOT Bureau of State  
Highway Programs  
(608) 264-7263 or  
joseph.nestler@dot.  
state.wi.us.

## Wisconsin Information System for Local Roads (WISLR)

WisDOT recently unveiled WISLR, its new Web-based GIS data management application for Wisconsin's 100,000 miles of local roads. Built in cooperation with local government agencies, it provides them and WisDOT with convenient and secure access to data that will improve decision-making.

WISLR provides access to a statewide GIS local road database for: displaying data geographically; viewing and

editing inventory data such as pavement width, type and condition rating, construction year, and shoulder, curb, traffic and length information; and viewing and printing reports and maps.

Its GIS database provides a powerful platform to be leveraged for future applications, including ones with significant traffic safety potential.

View of inventory data in the new WISLR data management system for Wisconsin's local roads. WISLR standardizes statewide road condition data, and enables users to download maps and reports from the Web.

Map	Attribute Name	Occurs	At Intersection	From Offset	To Offset	Length	Attribute Value
Owner	1 of 8	Abbey Ave (Tennant)	475	545	370	Owner: 261 Neshab(C), Cert Miles: 37 (Projected)	
Road Category	1 of 8	Abbey Ave (Tennant)	475	545	370	Cat: 3 Municipal Road, Sub	
Average Daily Traffic (ADT)	1 of 8	Abbey Ave (Tennant)	475	545	370	2nd E, Count: 150, Year: 2001	
Access Control	0 of 8		0	0	0		
Urban Location	0 of 8		0	0	0		
Federal LRP Area	1 of 8	Abbey Ave (Tennant)	475	545	370	LRP Area: 812 Appleton, Clon: 3 Urbanized	
Functional Class	1 of 8	Abbey Ave (Tennant)	475	545	370	Type: 90 Local Street (Linkage)	
ADT	0 of 8		0	0	0		
HPMS	0 of 8		0	0	0		
IRI	0 of 8		0	0	0		
PCV	0 of 8		0	0	0		
OTRUSOPT	0 of 8		0	0	0		

Using GIS to display data with its location highlighted on the map. From the upper right menu, users can select different data layers.





## Brown County

from page 3

Bureau of Transportation Safety, the AVL pilot project will now expand this capability by enabling dispatchers to accurately identify the locations of crashes, citations, crimes, road blockages and other incidents. Officer safety and response time will be improved because dispatchers can quickly locate the police vehicle closest to an incident.

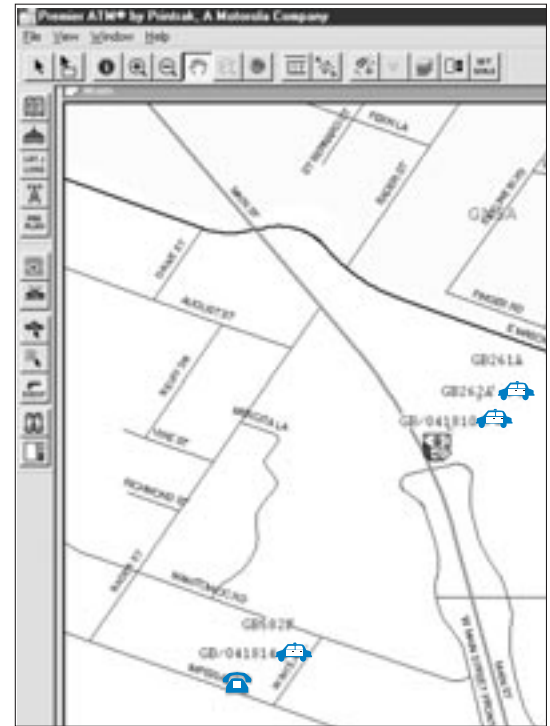
AVL data will be used in conjunction with the county's GIS address database and digital terrain model as follows:

- Locations of schools, taverns, major employers, etc. can be added to the GIS address database, and AVL data will help identify existing and potential hazards. For example, the data might reveal a high concentration of speeding citations in a school zone. Alcohol-related citations and crashes can be analyzed to see if high frequency is related to specific taverns.
- AVL data can be used in the county's digital terrain model to create a 3-D picture of crash sites to help determine causes. For example, AVL data can be compared with sight lines at an intersection to determine if poor visibility was a factor.

### Several important lessons learned

- Coordinating a project this size takes a significant amount of time and effort.

- This project is one of a handful of its kind in the country. Since no hardware/software vendor can currently be considered to be an AVL expert, information should be confirmed by several people before decisions are made.
- Complicated projects that involve several participants and relatively new technology will likely encounter "bugs" and implementation delays, so be patient.
- Police department chiefs and supervisors like the AVL technology, but many patrol officers are reluctant to accept GPS units in their vehicles because they feel like they are being monitored.



Contact Cole Runge at  
(920) 448-3400 or [coleru@ci.green-bay.wi.us](mailto:coleru@ci.green-bay.wi.us)

Also visit [www.co.brown.wi.us](http://www.co.brown.wi.us) and click on "Departments," then "Planning" and then "Transportation".

Screen seen by dispatchers at the Brown County Communication Center, showing locations of Green Bay Police Department squad cars and location (see telephone icon) of caller (including 911 calls). The AVL (Automatic Vehicle Location) system allows dispatchers to recommend which unit responds to a call. Depending on the incident, the system checks squad car locations every 10 to 40 seconds. Dispatchers can contact units both by radio and Computer Aided Dispatch (CAD). Once the dispatcher has assigned an incident to a unit, the CAD computer sends incident information to a computer in that squad car.

## The gist of GIS

from page 1

What questions can a GIS answer?

**LOCATION** For example, what is the worst location for pedestrian crashes?

**CONDITIONAL** Which intersection has both the most pedestrian crashes and traffic volume?

**TRENDS** What has changed in terms of vehicle crashes since the building of a roundabout?

**PATTERNS** Where are u-turn crashes occurring?

**MODELING** How do land use changes affect the frequency of crashes?

Work is now underway among state agencies and other organizations to develop shared data and distributed custodianship for various data layers. Internet map server technology allows users to view geographic data online and download public data sets, providing broad accessibility to, for example, crash information. To enhance collaboration, agencies are exploring flexible database and GIS software that can communicate with various data formats that can be served over the Internet.

A rapidly growing wealth of GIS data is now online, and help is available to learn how to use GIS effectively. See the article about the Wisconsin Public Safety GIS Users Group (page 1), the Wisconsin Land Information Program (at right), and a listing of further resources (page 8).

## COMPASS

from page 8

While COMPASS focuses on issues such as crime, housing and community assets, it can easily be used to foster traffic safety. For example, a neighborhood could supplement pedestrian crash data with moving violations from the local police department or municipal court to map out problem areas. Adding in schools and major retail centers would further fill in the big picture. Any location-based information can be included in the data infrastructure.

Contact Jim Pingel, Milwaukee Mayor's Office,  
at [jpinge@milwaukee.gov](mailto:jpinge@milwaukee.gov).

## Wisconsin Land Information Program (WLIP)

WLIP is a voluntary, statewide program that provides financial support to local government for land records modernization. For example, the program helped Marathon County (see page 2) and Brown County (see page 3) create their base maps on which other mapping layers can be digitally overlaid for analysis.

WLIP is administered by the Office of Land Information Services within the Wisconsin Department of Administration, which also administers the GIS Service Center with staff who demonstrate GIS technology; identify new applications and create custom products for governmental agencies; acquire, format, and distribute GIS data; and generally support GIS users.

Visit [www.doa.state.wi.us/olis/](http://www.doa.state.wi.us/olis/)

## Resources

### Wisconsin Public Safety GIS Users Group

See page 1

### Wisconsin Land Information Program

See page 7

### Wisconsin Land Information Association

[www.wlia.org](http://www.wlia.org)

### Wisconsin Land Information Clearinghouse

[wisclinc.state.wi.us](http://wisclinc.state.wi.us)

### UW Land Information & Computer Graphics Facility

Hands-on GIS workshops and short courses

[www.lic.wisc.edu](http://www.lic.wisc.edu)

### Wisconsin State Cartographer's Office

[www.geography.wisc.edu/sco/gis/](http://www.geography.wisc.edu/sco/gis/)

From the COMPASS website, a Community Map showing police station locations along with local crime statistics  
[www.milwaukee.gov/compass](http://www.milwaukee.gov/compass)

## Milwaukee

# COMPASS points toward public safety

Funded by the US Department of Justice, Milwaukee's COMPASS (Community Mapping, Planning & Analysis for Safety Strategies) project will help make public safety problem solving more strategic, data-driven and collaborative. It will strengthen many existing partnerships by providing:

- A comprehensive, city-wide data infrastructure (including crime and traffic incidents, and demographic, school and environmental data)
- GIS and other analytical tools
- Local research partners to "coach" community leaders in using the shared data to guide decision-making
- Strategic analysis of data to guide development of public safety programs

Project staff includes a policy director in the Mayor's Office, a technical director and two programmers. The policy director negotiates data sharing agreements with various agencies, working toward a multi-agency database without compromising privacy, security or ongoing operations. The technical staff compiles the database and provides GIS and other analytical tools. Directed by UW-Milwaukee's Center for Urban Initiatives and Research, the research team includes criminologists and geographers.

COMPASS uses technology to improve community collaboration and public safety solutions in two key ways:

The first is public access to data. Mayor Norquist strongly supports using technology to create a better-informed citizenry. The Web site at [www.milwaukee.gov/compass](http://www.milwaukee.gov/compass)

includes a Community Mapping application (see example) that enables citizens to create and print their own maps showing data on neighborhood crime, traffic safety issues, housing, etc.

COMPASS also improves data sharing, using GIS and other analytic tools to inform community leaders and policy makers.

*continued on page 7*



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